ABSTRACT OF THE DISCLOSURE

A gas-mixture-ignition-time estimation apparatus for an internal combustion engine estimates the temperature of a premixed gas mixture for PCCI combustion (i.e., cylinder interior temperature Tg), while relating it to the angle CA, on the basis of a state quantity of the cylinder interior gas at the time of start of compression (CAin) (heat energy of the cylinder interior gas at the time of start of compression), the amount of a change in the state quantity of the cylinder interior gas attributable to compression in a compression stroke (minute piston work), and the heat generation quantity of a cool flame generated in PCCI combustion prior to autoignition (hot flame) (cool flame heat generation quantity Aqlto). A time when the cylinder interior temperature Tg reaches a predetermined autoignition start temperature Tig is estimated as an autoignition start time (Caig) of the premixed gas mixture related to PCCI combustion. Since the cool flame heat generation quantity Oqlto is taken into consideration, the autoignition start time related to PCCI combustion can be estimated accurately.